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IMPLEMENTATION OF THE DEVICE DATA BANK ON THE HDL IBM COMPUTER.(U)  
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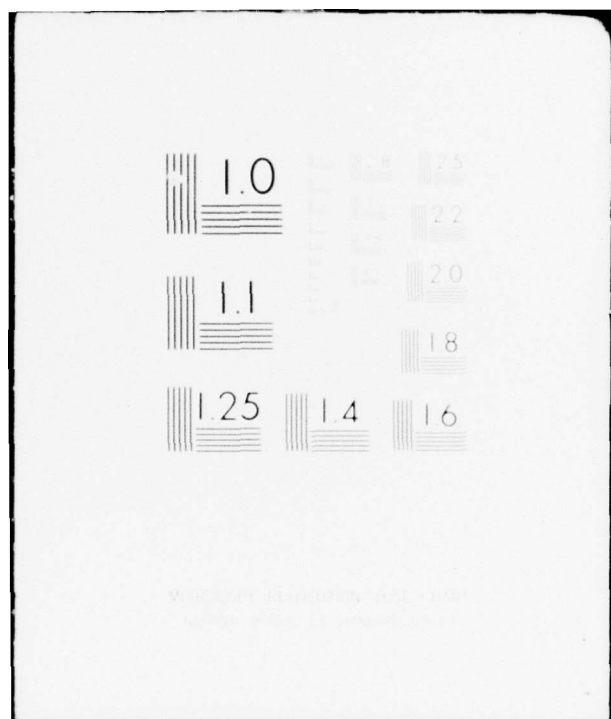
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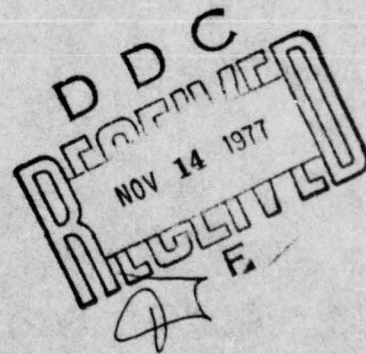
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TR-1819—Implementation of the Device Data Bank on the HDL IBM Computer, by Thomas V. Noon

AD A046480

Implementation of the Device Data Bank  
on the HDL IBM Computer

October 1977



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U.S. Army Materiel Development  
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Device Data Bank, as used by the DAMTRAC and, in the near future, the NET2 circuit-analysis programs on the Harry Diamond Laboratories' IBM 370/168 computer, is presented. The new file structure of the device libraries, access method for use of the device parameters by DAMTRAC and other computer programs, and a management program to manage and maintain the device data bank are presented in detail. The job control language (JCL) for executing the IBM version of DAMTRAC on the HDL computer is also presented.		

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## 1. INTRODUCTION

The effects of high-altitude electromagnetic pulses (HEMP) from nuclear weapons deployed at high altitudes can seriously degrade tactical weapon and communication systems vitally needed by the field Army prepared to fight a conventional and nuclear war. The Multiple Systems Evaluation Program (MSEP) was established to determine both the vulnerability of and the means for hardening many of these Army tactical systems to an HEMP environment. An essential step in the program is to develop analytic tools (such as computer programs for predicting transient data and system response) to evaluate system susceptibility to HEMP. These computer programs have been gathered into an applications package titled Generic Assessment Methods for a Priori Hardening of Systems (GAMPHS).<sup>1</sup> The GAMPHS application for the vulnerability and hardness assessment of systems covered by MSEP uses the programs described in this report in addition to other computer programs (see fig. 1).

This report describes one aspect of the effort by the Harry Diamond Laboratories (HDL) to convert DAMTRAC<sup>2</sup> (Damage Analysis Modified Transient Radiation Analysis by Computer) and the Device Data Bank\* (consisting of files of diodes and transistors with their equivalent-circuit parameters and damage data) from the Mobility Equipment Research and Development Command CDC computer to the HDL IBM 370/168 computer. The transmutations and modifications required to convert DAMTRAC are basically transparent to users of the CDC version of DAMTRAC except for the control language which directs the job execution (the job control language (JCL) for DAMTRAC is presented in app A). However, the conversion of the Device Data Bank files required the restructuring of the data files and the development of new programs to manage and maintain the data files, and to access and retrieve device data from these files. The file structure, management programs, and access method is discussed in detail in this report. Sufficient information about the software described in this report is provided to allow a programmer experienced in IBM FORTRAN and JCL and in the use of DAMTRAC to use the programs and concepts. Complete listings of the device libraries and parameter references are presented in section 5.

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<sup>1</sup>George Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1--Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)

<sup>2</sup>George Baker et al, Damage Analysis Modified TRAC, Harry Diamond Laboratories TM-76-6 (May 1975). *4016-76*

\*Charles P. Ruzic, Extension and Interfacing the MSEP Semiconductor Damage Data Bank for Analysis and Retrieval by DAMTRAC, Harry Diamond Laboratories TR-1821 (December 1977).

MULTIPLE SYSTEMS EVALUATION PROGRAM  
COMPUTER PROGRAM FLOW IN VULNERABILITY ASSESSMENT

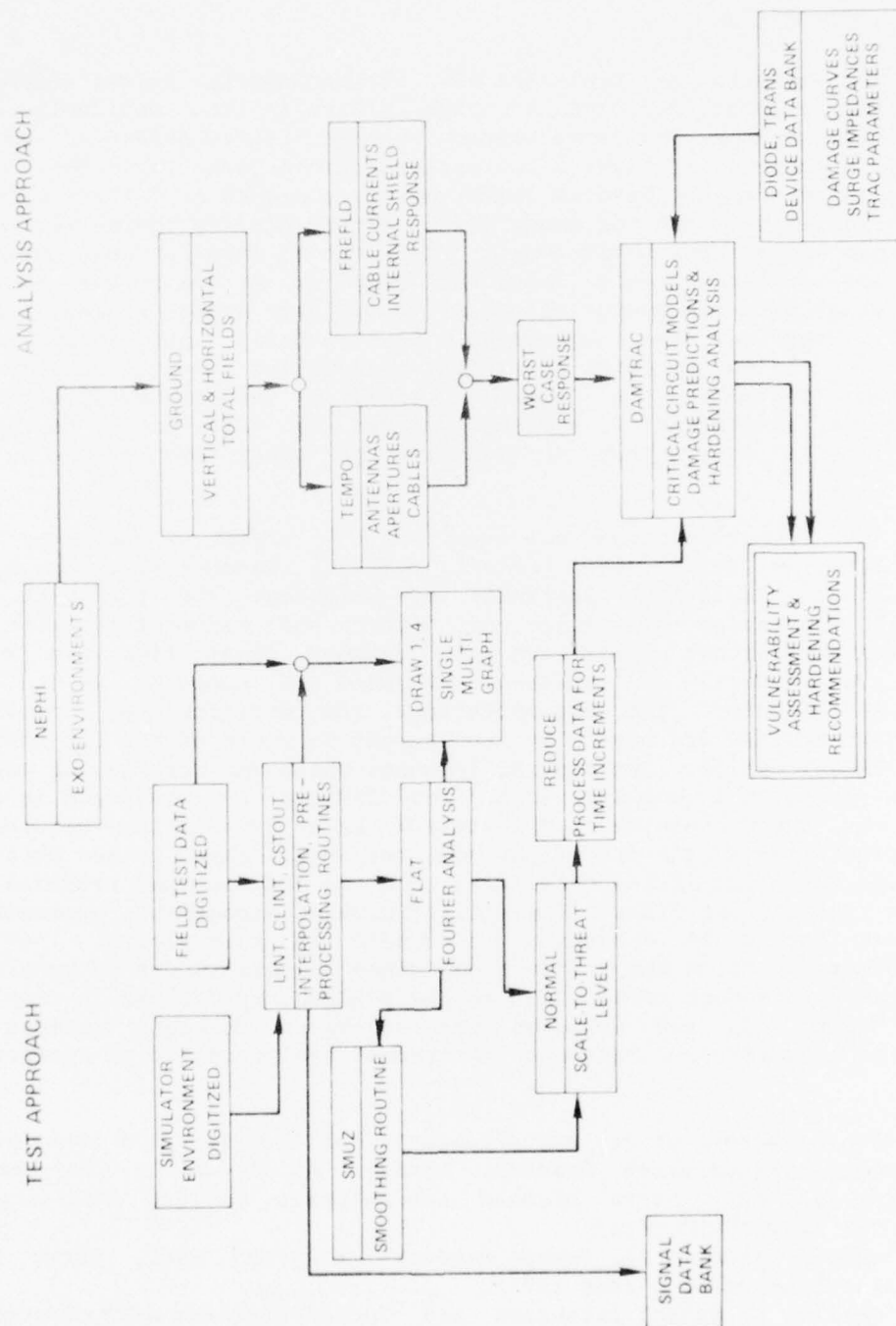


Figure 1. The GAMPHS application in vulnerability and hardness assessment.



## 2. DESCRIPTION OF THE DEVICE DATA BANK FILES

The Device Data Bank files are a collection of the equivalent-circuit values and damage parameters of different diode and transistor types stored by their device names. The equivalent-circuit and damage parameters are used as input for circuit analysis and for calculations of circuit damage due to EMP (electromagnetic pulse) by programs such as DAMTRAC and NET2. The existence of these files reduces the input data required by the circuit-analysis program by allowing the program users to specify only a device name. The circuit-analysis programs then search the Device Data Bank file for the device parameter.

The Device Data Bank files were created at HDL, using the IBM direct access file structure. The direct access file structure allows for access and modification of multirecord files at random without regard for the records' physical location. This random selection of records is a very desirable attribute for files of data which are retrieved by name keys (such as diode and transistor types).

### 2.1 Diode Device Library

The Diode Device Library is a direct access file with space reserved for 300 different diode types. Each diode type has space reserved for 19 device parameters, 11 parameter references, and a status flag. The 19 device parameters consist of the 7 TRAC<sup>3</sup> equivalent-circuit values and 12 device-damage values (4 presently unused). The definition of the diode device parameters is given in table I (p 8). The parameter references (see sect. 5) refer to the origin of the TRAC values and the last 10 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

### 2.2 Transistor Device Library

The Transistor Device Library is a direct access file with space reserved for 300 different transistor types. Each transistor type has space reserved for 40 device parameters, 10 parameter references, and a status flag. The 40 device parameters consist of the 16

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<sup>3</sup>E. D. Johnson et al, *Transient Radiation Analysis by Computer Program (TRAC)*, Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).

TABLE I. DEFINITION OF DIODE EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES

Note:  $P$  = power to damage;  $\tau$  = pulse duration

Symbol	Definition
IS	Reverse saturation current*
MD	Proportionality constant*
RDL	Leakage resistance*
CDO	Junction capacitance constant*
VDBI	Diffusion or built-in voltage*
TD	Diode time constant*
IPPD	Primary photocurrent constant*
VB	Breakdown voltage*
Surge Z	Reverse surge impedance*
R Bulk Forward	Forward bulk resistance
Surge Z Rev 1 $\mu$ s	Reverse surge impedance for 1- $\mu$ s square pulse
Surge Z Rev 10 $\mu$ s	Reverse surge impedance for 10- $\mu$ s square pulse
K Damage Rev <50 ns	Measured reverse damage constant ( $\tau < 50$ ns) $K = P\tau$
K Damage Rev >50 ns	Measured reverse damage constant ( $\tau > 50$ ns) $K = P\tau^{1/2}$
K Damage Forward	Measured forward damage constant using $K = P\tau$
K	Not used, available of other damage constants

\*Used by DAMTRAC for diode model.

TRAC<sup>3</sup> equivalent-circuit values and 24 device-damage values (6 presently unused). The definitions of the transistor device parameters are given in table II. The parameter references (see sect. 5) refer to the origin of the last 20 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

<sup>3</sup>E. D. Johnson et al, *Transient Radiation Analysis by Computer Program (TRAC)*, Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).

TABLE II. DEFINITION OF TRANSISTOR EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES.

Note: P = power to damage;  $\tau$  = pulse duration

Symbol	Definition
HFEN	Normal common-emitter current gain*
HFEI	Inverse common-emitter current gain*
TN	Emitter-time constant*
TI	Collector-time constant*
ICS	Collector reverse-saturation current*
MC	C-B proportionality constant in exponent*
CCO	C-B junction capacitance at zero bias*
VCBI	C-B junction-diffusion potential*
RCL	C-B leakage resistance*
IES	Emitter reverse-saturation current*
ME	E-B proportionality constant in exponent*
CEO	E-B junction capacitance at zero bias*
VEBI	E-B junction diffusion potential*
REL	E-B leakage resistance*
IPPC	Primary photocurrent for the collector-base junction*
IPPE	Primary photocurrent for the emitter-base junction*
C-BBDV	C-B breakdown voltage*
E-BBDV	E-B breakdown voltage*
Surge ZC	C-B reverse surge impedance (0.1- $\mu$ s pulse width)*
Surge ZE	E-B reverse surge impedance (0.1- $\mu$ s pulse width)*
Bulk Resistance C-B	Junction forward bulk resistance
Bulk Resistance E-B	Junction forward bulk resistance
Z Surge C-B 1 $\mu$ s	Reverse surge impedance (1- $\mu$ s pulse width)
Z Surge C-B 10 $\mu$ s	Reverse surge impedance (10- $\mu$ s pulse width)
Z Surge E-B 1 $\mu$ s	Reverse surge impedance (1- $\mu$ s pulse width)
Z Surge E-B 10 $\mu$ s	Reverse surge impedance (10- $\mu$ s pulse width)
Damage K (<50 ns)C-B	Reverse biased damage constant ( $\tau$ <50 ns) $K=P\tau$
Damage K (<50 ns)E-B	Reverse biased damage constant ( $\tau$ <50 ns) $K=P\tau$
Damage K (>50 ns)C-B	Reverse biased damage constant ( $\tau$ >50 ns) $K=P\frac{1}{2}\tau$
Damage K (>50 ns)E-B	Reverse biased damage constant ( $\tau$ >50 ns) $K=P\frac{1}{2}\tau$
K Forward C-B	Forward biased damage constant $K=P\tau$
K Forward E-B	Forward biased damage constant $K=P\tau$
K	Available for other damage constants

\*Used by DAMTRAC for transistor model.

### 3. MANAGEMENT PROGRAM FOR THE DEVICE DATA BANK--MPD2B

#### 3.1 Description of MPD2B

To simplify and minimize the effort necessary to manage and maintain the Device Data Bank, only one program, MPD2B, is required to create, update, add to, and list the device libraries. Through the use of action requests and action control cards as part of the required input data to the program, any of the above-mentioned functions can be performed on either or both device libraries in one job. Each action request specifies the action to be taken and the library to which the action refers. The action requests for the device libraries are as follows.

For the Diode Device Library:

- (1) CREATE DIODE FILE
- (2) UPDATE DIODE FILE
- (3) ADD TO DIODE FILE
- (4) LIST DIODE FILE

For the Transistor Device Library:

- (1) CREATE TRANSISTOR FILE
- (2) UPDATE TRANSISTOR FILE
- (3) ADD TO TRANSISTOR FILE
- (4) LIST TRANSISTOR FILE

The action control cards, END OF ACTION and FINISH, are required to terminate one action request (CREATE, UPDATE, ADD TO) and either prompt the program for another action request or signal the end of the job. For all action requests and action control cards, the command (CREATE, UPDATE, ADD TO, LIST, END OF ACTION, FINISH) must begin in column 1 of the data card, and for action requests specifying a file name (CREATE, UPDATE, ADD TO, LIST), the file name (DIODE FILE, TRANSISTOR FILE) must begin in column 8 of the data card. Improper coding of an action request or action control card causes the job to stop with a user-supplied STOP code of 1.

#### 3.2 Description of the Action Requests

##### 3.2.1 CREATE

The action request CREATE must be the first action request for either device library. The CREATE action request establishes the file definition requirements and writes the supplied device data onto the file beginning at the second record and continuing onto subsequent records for each different device name until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the record index and the date of the creation run are written onto the first record for use by the LIST action requests.

### 3.2.2 UPDATE

The UPDATE action request is used for changing parameter values previously defined or for defining new parameter values for devices already in the pertinent device library. Device data are read and the appropriate device record updated until an END OF ACTION control card is encountered. An UPDATE flag and the date of the update run are then written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

### 3.2.3 ADD TO

The ADD TO action request is used for adding new device entries to a device library. Device data are read with each new device added to the next available record in the file until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the new record index, an ADD TO flag, and the date of the add run are written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

### 3.2.4 LIST

The LIST action request is used for listing the devices, device parameters, parameter references, and TRAC flag that are stored in a device library. Each device name is listed along with its associated parameter values. The devices are listed in the IBM collating sequence starting with the first character of the device name. In addition to the list of devices, a title page is printed giving the name of the device library (i.e., Diode Device Library, Transistor Device Library), the current date, the library creation date, and the last action request of the file (if any) and its date. The words "End of Listing" are printed after the last device to signify the end of the listing. The LIST action request should be the last action taken on a file after every run of the MPD2B program. Also, the LIST action request does not need to be followed by an END OF ACTION action request as the LIST action request does not read any data from the input stream.

### 3.2.5 END OF ACTION

The END OF ACTION action control card is used to terminate the input data to an action request (CREATE, UPDATE, ADD TO). An END OF ACTION card must follow the input data for all the previous action requests. An END OF ACTION card is not required after the LIST action request since there are no input data to this command.

### 3.2.6 FINISH

The FINISH action control card terminates the input data for the MPD2B program. The FINISH action control card must be the last card of the input data.



### 3.3 Device Data Entry Format

#### 3.3.1 Diode Device Library

To enter diode device data into the Diode Device Library, four data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table I, sect. 2 for definitions of parameters) and formats:

Card 1: Device Name, IS,  
MD,  
RDL,  
CDO,  
VDBI,  
TD  
Card 2: Device Name, IPPD,  
VB,  
Surge Z,  
R Bulk Forward,  
Surge Z Rev 1  $\mu$ s,  
Surge Z Rev 10  $\mu$ s  
Card 3: Device Name, K Damage Rev <50 ns,  
K Damage Rev >50 ns,  
K Damage Forward,  
K,  
K,  
K  
Card 4: Device Name, K,  
TRAC Ref,  
R Bulk Forward Ref,  
Surge Z Rev 1  $\mu$ s Ref,  
Surge Z Rev 10  $\mu$ s Ref,  
K Damage Rev <50 ns Ref,  
K Damage Rev >50 ns Ref,  
K Damage Forward Ref,  
K Ref,  
K Ref,  
K Ref,  
K Ref

Format for Cards 1, 2, and 3: (3A4, 3X, 6E10.3)  
Format for Card 4: (3A4, 3X, E10.3, 6X 11  
(1X, I3))

Sample diode data set: (see fig. 2, p 14)

Diode type 1N1202	
IS = $4.25 \times 10^{-10}$	Surge Z = 64
MD = 1.62	R Bulk Forward = 1, Ref No. 25
RDL = $4.13 \times 10^{10}$	Surge Z Rev 1 $\mu$ s = 65, Ref No. 25
CDO = $1.3 \times 10^{-11}$	Surge Z Rev 10 $\mu$ s = 65, Ref No. 25
VDBI = 1	K Damage Rev <50 ns = not defined
TD = $1 \times 10^{-7}$	K Damage Rev >50 ns = 14, Ref No. 25
IPPD = $1 \times 10^{-4}$	K Damage Forward = not defined
VB = 200	TRAC Ref = not defined

For UPDATE action requests, all four data cards for the device being updated must be used as input. All parameter values and parameter reference values which were previously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

### 3.3.2 Transistor Device Library

To enter transistor device data into the Transistor Device Library, seven data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table II, sect. 2 for definition of parameters) and formats.

Card 1:	Device Name, HFEN, HFEI, TN, TI, ICS, MC
Card 2:	Device Name, CCO, VCBI, RCL, IES, ME, CEO
Card 3:	Device Name, VEBI, REL, IPPC, IPPE, C-BBDV, E-BBDV



Card 4: Device Name, Surge ZC,  
 Surge ZE,  
 Bulk Resistance C-B,  
 Bulk Resistance E-B,  
 Z Surge C-B 1  $\mu$ s,  
 Z Surge C-B 10  $\mu$ s  
 Card 5: Device Name, Z Surge E-B 1  $\mu$ s,  
 Z Surge E-B 10  $\mu$ s,  
 Damage F (<50 ns) C-B,  
 Damage K (<50 ns) E-B,  
 Damage K (>50 ns) C-B,  
 Damage K (>50 ns) E-B  
 Card 6: Device Name, K Forward C-B,  
 K Forward E-B,  
 K C-B,  
 K E-B,  
 K C-B,  
 K E-B,  
 Card 7: Device Name, Bulk Resistance Ref,  
 Z Surge C-B Ref,  
 Z Surge E-B Ref,  
 Damage K (<50 ns) Ref,  
 Damage K (>50 ns) Ref,  
 K Forward Ref,  
 K Ref,  
 K Ref

Format for Cards 1, 2, 3, 4, 5, and 6: (3A4, 3X, 6E10.3)  
 Format for Card 7: (3A4, 10(1X, I3))

Sample transistor data set: (see fig. 3)

Transistor type 2N705

HFEN = 25	C-BBDV	= 15	
HFEBI = not defined	E-BBDV	= 3.5	
TN = $1.06 \times 10^{-9}$	Surge ZC	= 72.5	
TI = $5.03 \times 10^{-8}$	Surge ZE	= 165	
ICS = $10^{-5}$	Bulk Resistance C-B	= 0.95	} Ref No. 34
MC = 1.83	Bulk Resistance E-B	= 2.2	
CCO = $1.37 \times 10^{-11}$	Z Surge C-B 1 $\mu$ s	= 150	} Ref No. 34
VCBI = 0.3	Z Surge C-B 10 $\mu$ s	= 360	
RCL = $10^7$	Z Surge E-B 1 $\mu$ s	= 340	} Ref No. 34
IES = $10^{-5}$	Z Surge E-B 10 $\mu$ s	= 340	
ME = 1.83	Damage K (<50 ns)C-B	= $3.18 \times 10^{-6}$	} Ref
CEO = $6.39 \times 10^{-12}$	Damage K (<50 ns)E-B	= $1.13 \times 10^{-6}$	
VEBI = 0.3	Damage K (>50 ns)C-B	= $1.42 \times 10^{-2}$	} No. 60
REL = $10^7$	Damage K (>50 ns)E-B	= $5.06 \times 10^{-3}$	
IPPC = $10^{-3}$	K Forward C-B	= $7.9 \times 10^{-5}$	} Ref
IPPE = $10^{-5}$	K Forward E-B	= $3.6 \times 10^{-5}$	





For UPDATE action requests, all seven data cards for the device being updated must be used as input. All parameter values and parameter reference values which were previously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

#### 3.4 Program Messages Issued by MPD2B

The following messages are printed during the execution of the MPD2B program.

\*\*\*\*\*ERROR ON INPUT CONTROL CARD  
\*\*\*\*\*JOB TERMINATED

This message is printed when an action request card is not recognized. The job is terminated. This message is accompanied by a STOP 1.

---

\*\*\*\*\*DATA FOR X DEVICES SUCCESSFULLY WRITTEN ON DEVICE SET Y

This message is printed at the completion of a successful CREATE run. Here, X is the number of devices written on the file and Y is the device set where the data were written (11 for the diode file and 12 for the transistor file).

---

\*\*\*\*\*UPDATING OF THE DIODE FILE COMPLETED  
or  
\*\*\*\*\*UPDATING OF THE TRANSISTOR FILE COMPLETED

These messages are printed at the completion of a successful UPDATE run.

---

\*\*\*\*\*DEVICES SUCCESSFULLY ADDED TO DIODE FILE  
or  
\*\*\*\*\*DEVICES SUCCESSFULLY ADDED TO TRANSISTOR FILE

This message is printed at the completion of a successful ADD TO run.

---

\*\*\*\*\*END ENCOUNTERED UNEXPECTEDLY ON INPUT

This message is printed if an end of record card is read during the input of data. This message is accompanied by a STOP 1.

---

\*\*\*\*\*DEVICES NAMES DO NOT MATCH FOR DEVICE X (Y)

This message is printed if the device names do not match while the input data cards for a particular device are read. Here, X is the device name first read and Y is the device name read which did not match. This message is accompanied by a STOP 1.

\*\*\*\*\*DEVICE NAME NOT LOCATED IN DIODE FILE

OR

\*\*\*\*\*DEVICE NAME NOT LOCATED IN TRANSISTOR FILE

These messages are printed during an UPDATE run if the device to be updated is not located in the file. This message is accompanied by a STOP 3.

\*\*\*\*\*DEVICE X IS ALREADY IN THE DIODE DEVICE DATA FILE  
(ITEM No. Y)

OR

\*\*\*\*\*DEVICE X IS ALREADY IN THE TRANSISTOR DEVICE DATA FILE  
(ITEM No. Y)

These messages are printed during an ADD TO run if device X, to be added to the file, is already in the device file. The item Y is the location of the device on a current listing of the file.

\*\*\*\*\*INDEXING ERROR WHILE UPDATING DIODE DEVICE DATA FILE

\*\*\*\*\*INDEXING ERROR WHILE UPDATING TRANSISTOR DEVICE DATA FILE

\*\*\*\*\*INDEXING ERROR WHILE ADDING TO DIODE DEVICE DATA FILE

\*\*\*\*\*INDEXING ERROR WHILE ADDING TO TRANSISTOR DEVICE DATA FILE

\*\*\*\*\*INDEXING ERROR WHILE LISTING DIODE DEVICE DATA FILE

OR

\*\*\*\*\*INDEXING ERROR WHILE LISTING TRANSISTOR DEVICE DATA FILE

These messages are printed if the indexing key stored with the file has been corrupted. The indexing key is checked for the UPDATE, ADD TO, and LIST action requests. A CREATE run for the particular file is recommended. This message is accompanied by a STOP 2.

\*\*\*\*\*END OF JOB

This message is printed after the FINISH action request has been processed.

### 3.5 Sample Action Requests

The following are sample action request input data for MPD2B. The last action request to any device file for any run should be the LIST action request.

```

Sample action request input for a CREATE run
CREATE DIODE FILE
  (enter diode device data)
END OF ACTION
LIST  DIODE FILE
FINISH

```

```

Sample action request input for an UPDATE and ADD TO run
UPDATE DIODE FILE
  (enter diode device data)
END OF ACTION
ADD TO TRANSISTOR FILE
  (enter transistor device data)
END OF ACTION
LIST  DIODE FILE
LIST  TRANSISTOR FILE
FINISH

```

It should be noted that the action requests to the diode or transistor data files can be used in any order and do not have to be grouped by file types.

#### 4. INTERFACING DEVICE DATA BANK WITH DAMTRAC

The interfacing of the IBM versions of the Device Data Bank and DAMTRAC was accomplished in much the same manner as was used in the CDC versions. Circuit piece-part data decks constructed for use with the MERADCOM CDC version of DAMTRAC require no changes to be used as input for the HDL IBM version. The manner of requesting the device parameter to be read from the Device Data Bank has remained the same; "device name/R" states that the device parameters do not follow but must be read from the appropriate device library. Only the supporting subroutine which retrieves the appropriate device parameter is different.

The subroutine OPENDA with entry points READDA and WRITDA was written to provide DAMTRAC with the proper access method to the Device Data Bank. Subroutine OPENDA contains the DEFINE FILE statements for the Diode and Transistor Device Libraries and the CALL to OPENDA fills and orders a table of device names for both device libraries. The CALL to READDA locates the device in the appropriate device table for which the parameters have been requested, and reads the requested device parameter into a DAMTRAC supplied array. Before returning to DAMTRAC, the TRAC FLAG for the device is checked. If all the necessary device parameters for the DAMTRAC analysis calculation are not defined (TRAC FLAG set to 0) a message is written on the line printer to notify the user of that fact and the job is terminated. However, if all the necessary device parameters are defined (TRAC FLAG set to 1) the device

parameters are returned to DAMTRAC. To maintain the integrity of the device libraries, the ability to enter device parameters into the device libraries from DAMTRAC was not implemented on the IBM version; however, to maintain compatibility with the DAMTRAC and TRAC manuals, a CALL to WRITDA is executed when a request to enter device parameters is encountered. The CALL to WRITDA writes a message on the line printer notifying the user that data cannot be written in a device library and then returns to DAMTRAC.

#### 5. LISTING OF DIODE AND TRANSISTOR DEVICE LIBRARIES

To aid the EMP damage analyst, this section presents listings of the devices contained in the device libraries. Table III of the section gives parameter references found in the diode device library--for example, code 034 of table III is shown in the library as ( 34).

DIODE DEVICE LIBRARY

PAGE 1

DEVICE NAME	IS	ND	RCL	CON	VOBI	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	R RUL	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
FORWARD	REV IUS	REV IUS	REV IUS	REV >ONS	REV >ONS	FORWARD	(REF)	(REF)	(REF)	(REF)
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
IR66735	0	0	0	0	0	0	0	0	1.00E+00	( 61)
(0)	0	0	0	0	0	0	0	0	0	0
	( 34)	( 34)	( 34)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
MS1054	0	0	0	0	0	0	0	0	4.50E+03	( 61)
(0)	0	0	0	0	0	0	0	0	0	0
	( 34)	( 34)	( 34)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
MS1040	0	0	0	0	0	0	0	0	5.75E+01	( 61)
(0)	0	0	0	0	0	0	0	0	0	0
	( 34)	( 34)	( 34)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
PC115	0	0	0	0	0	0	0	0	1.35E+02	( 61)
(1)	0	0	0	0	0	0	0	0	0	0
	( 33)	( 33)	( 33)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
STEP	0	0	0	0	0	0	0	0	1.00E-02	0
(0)	0	0	0	0	0	0	0	0	0	0
	( 33)	( 33)	( 33)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
INCAP	0	0	0	0	0	0	0	0	1.23E+03	0
(1)	0	0	0	0	0	0	0	0	0	0
	( 33)	( 33)	( 33)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
INDUMY	0	0	0	0	0	0	0	0	1.44E+02	0
(1)	0	0	0	0	0	0	0	0	0	0
	( 33)	( 33)	( 33)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)
INF100	0	0	0	0	0	0	0	0	2.10E+01	0
(1)	0	0	0	0	0	0	0	0	0	0
	( 33)	( 33)	( 33)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)	( 60)



DIODE DEVICE LIBRARY (CONT'D)

PAGE 2

DEVICE NAME	IS	MO	KDL	CUO	VDBI	TO	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	+	+	+	+	+	+	+	+	+
1N4000	4.50E-09	1.84E+00	1.60E+09	2.25E-12	8.00E-01	1.00E-06	1.00E-04	7.50E+01	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N4200	5.15E-11	1.61E+00	5.00E+08	7.18E-13	1.04E+00	7.08E-10	1.00E-04	3.00E+01	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N5760	2.60E-09	1.55E+00	5.60E+08	2.12E-12	8.00E-01	1.20E-07	1.00E-04	1.50E+02	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N5850	8.97E-14	1.00E+00	5.70E+08	1.41E-09	5.00E-01	1.59E-05	1.00E-04	4.00E+02	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N5950	3.20E-09	1.73E+00	1.70E+09	2.01E-12	8.00E-01	2.05E-07	1.00E-04	5.00E+02	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N6205A	1.17E-12	1.19E+00	1.15E+10	1.04E-10	8.00E-01	3.26E-07	1.00E-04	5.00E+01	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N6205S	6.60E-12	1.16E+00	8.50E+09	1.10E-10	8.00E-01	2.36E-07	1.00E-04	5.00E+01	2.10E+01
(1)	+	+	+	+	+	+	+	+	+
1N6205C	3.93E-11	1.28E+00	1.90E+09	8.45E-11	8.20E-01	3.00E-07	1.00E-04	5.00E+01	2.10E+01
(1)	+	+	+	+	+	+	+	+	+

DIODE DEVICE LIBRARY (Cont'd)

PAGE 3

DEVICE NAME	IS	MO	RDL	COO	VBI	TO	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
FORWARD	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	(REF)	(REF)	(REF)	(REF)
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1NUR2050	5.62E-11	1.41E+00	9.30E+09	1.16E-10	9.00E-01	4.53E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										
1NUR205E	2.09E-11	1.24E+00	8.90E+09	1.08E-10	8.50E-01	3.05E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										
1NUR205F	7.07E-11	1.34E+00	7.10E+09	1.19E-10	8.50E-01	2.08E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										
1N71PP	2.10E-15	1.10E+00	1.00E-09	1.00E-12	2.00E+00	2.60E-10		7.50E+01	5.00E+00	
(0)										
1N100	2.50E-06	2.63E+00	1.00E+06	7.07E-13	5.00E-01	1.59E-09	1.00E-04	8.00E+01	2.10E+01	
(1)										
1N1200	1.78E-09	1.79E+00	1.00E+10	1.00E-12	9.00E-01	1.00E-07	1.00E-04	1.00E+02	9.00E+02	
(1)										
1N1202	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	6.40E+01	
(1)										
1N1202AK	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	1.13E+03	( 72)
(1)										

DIODE DEVICE LIBRARY (Cont'd)

														PAGE 4	
DEVICE NAME	IS	MD	RDL	CDU	VBI	TO	IPD	VB	SURGE Z	(TRAC REF)					
(TRAC FLAG)	R BUL	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K					
FORWARD	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS	REV IUS					
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)					
<hr/>															
IN1204A	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	4.00E+02	1.10E-01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313A	4.26E-14	1.06E+00	1.70E+10	2.60E-10	8.50E-01	2.15E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313B	2.09E-14	1.03E+00	1.28E+10	4.12E-10	8.50E-01	1.94E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313C	1.05E-14	1.02E+00	2.53E+10	2.49E-10	8.50E-01	2.61E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313D	1.00E-13	1.01E+00	1.96E+10	2.91E-10	8.00E-01	2.30E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313E	1.00E-13	1.01E+00	1.50E+10	2.49E-10	8.00E-01	2.57E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1313F	5.00E-13	1.07E+00	8.00E+09	4.02E-10	8.00E-01	2.49E-07	1.00E-04	8.75E+00	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						
IN1315A	7.06E-14	1.08E+00	2.50E+10	2.00E-10	9.00E-01	2.17E-07	1.00E-04	1.28E+01	2.10E+01						
(1)	----	----	----	----	----	----	----	----	----						

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	KOL	CCU	VDR1	TD	IPPO	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	K BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
FORWARD	REV 105	REV 105	REV 105	REV 105	REV 105	REV 105	(REF)	(REF)	(REF)	(REF)
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
IN1315E	3.30E-13	1.12E+00	2.60E+10	2.11E-10	9.00E-01	1.15E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										
IN1315C	6.60E-14	1.11E+00	1.40E+09	4.01E-10	9.00E-01	2.63E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										
IN1315C	4.36E-13	1.14E+00	7.00E+09	2.42E-10	9.00E-01	1.29E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										
IN1315F	7.25E-14	1.06E+00	2.50E+10	2.11E-10	9.00E-01	1.59E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										
IN140	2.87E-12	6.90E-01	1.60E+05	2.83E-11	5.00E-01	1.59E-07	1.00E-04	8.00E+01	2.10E+01	
(1)										
IN1462	1.00E-13	1.00E+00	1.00E+07	1.00E-09	1.00E+00	1.00E-12	1.00E-04	4.70E+00	7.00E-02	
(1)										
IN1614	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.00E+02	2.10E+01	
(1)										
IN1731A	2.55E-01	5.35E+03	5.35E+03	4.03E-04	1.80E+00	1.90E-01	3.80E-01		1.45E+03	(61)
(0)	(34)	(34)	(34)	(60)	(60)	(60)	(22)			

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME	IS	MO	REL	CUD	VUB1	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
REMARK	+	+	+	+	+	+	+	+	+	+
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N2191	1.25E-15	5.90E-01	4.00E+05	7.00E-13	5.00E-01	1.59E-08	1.00E-04	9.00E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N2199	2.00E-09	1.71E+00	1.00E+09	2.83E-12	5.00E-01	2.27E-08	1.00E-04	1.44E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N2560	---	---	---	---	---	---	---	---	---	---
(0)	1.70E-01	4.40E+01	4.25E+01	1.13E-02	5.06E+01	---	---	---	---	---
(1)	( 62)	( 71)	( 71)	( 60)	( 60)	---	---	---	---	---
1N270	1.24E-06	1.67E+00	5.00E+05	1.13E-12	5.00E-01	3.18E-08	1.00E-04	1.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N273A	1.95E-06	1.44E+00	2.82E+06	9.26E-13	5.00E-01	1.02E-08	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N273B	2.75E-06	1.59E+00	2.46E+06	7.64E-13	5.00E-01	1.05E-08	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N273C	3.40E-06	1.66E+00	3.00E+06	1.05E-12	5.50E-01	5.41E-09	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N273D	3.57E-06	1.66E+00	4.40E+06	7.78E-13	5.00E-01	7.02E-09	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	RDL	CDL	VORI	ID	IPPD	VB	SURGE Z	ITRAC REF
(TRAC FLAG)	K BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV 100	REV 100	REV 500	REV 500	REV 500	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N273E	9.31E-06	1.72E+00	4.50E+06	7.82E-13	5.50E-01	5.78E-09	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N273F	2.82E-06	1.54E+00	1.60E+06	9.33E-13	5.00E-01	6.65E-09	1.00E-04	3.20E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N276	5.60E-07	1.94E+00	8.00E+05	5.00E-13	6.00E-01	6.50E-09	1.00E-04	1.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N277	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	1.25E+02	5.10E+03	(61)
(1)	---	---	---	---	---	---	---	---	---	---
	6.90E-01	7.60E+03	7.60E+03	3.95E-06	1.77E-02	3.70E-04	2.70E-02	---	---	---
	(34)	(34)	(34)	(60)	(60)	(60)	(20)	---	---	---
1N279	1.24E-06	1.67E+00	3.80E+06	2.83E-11	5.00E-01	3.18E-08	1.00E-04	3.20E+01	2.10E+02	---
(1)	---	---	---	---	---	---	---	---	---	---
1N2823E	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	3.00E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N2846E	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	2.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	1.05E-01	5.50E-01	3.60E-01	7.08E-03	1.50E+01	---	---	---	---	---
	(62)	(34)	(34)	(60)	(17)	---	---	---	---	---
1N2991E	---	---	---	---	---	---	---	---	---	---
(0)	---	---	---	---	---	---	---	---	---	---



DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME	IS	MD	RDL	CDD	VDEI	TD	IPPD	VB	SURGE Z	* (TRAC REF)	PAGE	8
IN3024	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.30E+01	2.10E+01			
(1)												
IN3025B	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.60E+01	3.50E-01	( 61)		
(1)	8.50E-02	3.50E-01	6.00E-01	8.49E-04	3.80E+00	4.40E-02	1.90E+00					
( 34)		( 62)	( 62)	( 60)	( 60)	( 60)	( 17)					
IN3027B	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	2.00E+01	2.10E+01			
(1)												
IN3033B	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	3.60E+01	2.10E+01			
(1)												
IN3034	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	3.90E+01	2.10E+01			
(1)												
IN3064	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	4.00E-09	1.00E-04	7.50E+01	5.00E+00			
(1)												
IN3071	9.10E-09	1.94E+00	4.50E+09	1.50E-12	1.00E+00	8.00E-07	1.00E-04	2.00E+02	2.10E+01			
(1)												
IN308	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	1.00E+02	2.10E+01			
(1)												

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	KOL	COD	VDB1	TD	IPPD	VB	SURGE 2	(TRAC REF)
(TRAC FLAG)	K BULK	SURGE 2	K DAMAGE	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV 105	REV 105	REV 105	REV 105	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N3565	5.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.60E+01	2.00E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N36C0	1.58E-09	1.66E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	5.00E+01	5.00E+00	---
(1)	---	---	---	---	---	---	---	---	---	---
1N3605	3.77E-09	1.96E+00	4.86E+09	8.57E-13	1.28E+00	5.79E-09	1.00E-04	4.00E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N3611	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N3669	1.30E-10	1.38E+00	1.10E+06	2.30E-11	8.00E-01	4.64E-07	1.00E-04	7.00E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N4001	5.00E-09	1.84E+00	6.40E+08	1.30E-11	1.00E+00	1.19E-06	1.00E-04	5.00E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N4003	4.20E-09	1.76E+00	2.00E+10	2.30E-11	1.00E+00	6.82E-06	1.00E-04	1.50E+03	1.60E+02	---
(1)	---	---	---	---	---	---	---	---	---	---
1N4005	6.20E-09	1.84E+00	1.20E+09	3.60E-11	1.00E+00	1.48E-05	1.00E-04	1.50E+03	1.20E+02	---
(1)	---	---	---	---	---	---	---	---	---	---

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	CDO	VDBI	TO	IPPD	VR	SURGE Z	(TRAC REF)
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
8 BULK	+	+	+	+	+	+	+	+	+	+
FORWARD	+	+	+	+	+	+	+	+	+	+
(REF)	+	+	+	+	+	+	+	+	+	+
1N4006	9.00E-09	1.84E+00	8.20E+09	2.50E-11	1.00E+00	6.19E-06	1.00E-04	8.00E+02	1.00E+02	---
(1)	---	---	---	---	---	---	---	---	---	---
1N4148	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	7.50E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N4249	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	1.00E+03	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N457	7.40E-12	1.36E+00	2.70E+10	5.60E-12	8.50E-01	4.91E-07	1.00E-04	2.10E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N458	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	1.50E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N459	5.80E-11	1.41E+00	2.00E+12	1.20E-11	8.00E-01	5.84E-07	1.00E-04	2.30E+02	8.30E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N459A	9.62E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.00E+02	3.60E+00	---
(1)	---	---	---	---	---	---	---	---	---	---
1N461	9.62E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	3.50E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	RDL	COG	VDR1	TO	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	Q BULN	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV 105	REV 105	REV 50NS	REV 50NS	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N462	0.62E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	8.00E+01	2.10E-01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N482A	3.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	3.60E+01	7.60E+02	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N4858	---	---	---	---	---	---	---	---	---	---
(0)	4.63E-01	9.62E+02	5.32E+02	1.13E-04	5.06E-01	9.60E-03	3.00E-01	---	---	---
	(34)	(34)	(34)	(60)	(60)	(60)	(22)	---	---	---
1N537	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.20E-06	1.00E-04	1.00E+02	3.00E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N536	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N538	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N540	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	4.00E+02	9.40E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
1N547	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	6.00E+02	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	RDL	COO	VORI	TD	IPPO	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
R BULK	+	+	+	+	+	+	+	+	+	+
FIRMSU	+	+	+	+	+	+	+	+	+	+
(REF)	+	+	+	+	+	+	+	+	+	+
1N600	1.00E-13	1.00E+00	1.00E+07	1.00E-09	1.00E+00	1.00E-12	1.00E-04	4.70E+00	7.00E-02	+
(1)	+	+	+	+	+	+	+	+	+	+
	1.60E-02	7.00E-02								+
	+	( 32)	+							+
1N603	2.87E-13	9.90E-01	1.00E+06	1.41E-10	5.00E-01	1.59E-07	1.00E-04	1.00E+02	2.10E+01	+
(1)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
1N645	4.52E-10	1.62E+00	4.13E+10	1.30E-11	8.00E-01	1.86E-06	1.00E-04	2.25E+02	1.75E+03	( 61)
(1)	+	+	+	+	+	+	+	+	+	+
	2.25E-01	6.90E+03	6.90E+03	1.49E-04	6.65E-01	6.60E-02	2.80E+00	3.63E+00	7.90E-01	+
	( 34)	( 66)	( 66)	( 60)	( 60)	( 60)	( 17)	( 2)	( 13)	+
1N648	5.20E-10	1.64E+00	8.50E+08	2.46E-08	8.00E-01	1.86E-06	1.00E-04	2.25E+02	2.10E+01	+
(1)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
1N649	5.20E-10	1.64E+00	2.70E+10	2.20E-12	8.00E-01	1.86E-06	1.00E-04	2.25E+02	8.70E+00	+
(1)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
1N652	5.20E-10	1.64E+00	2.70E+10	1.30E-12	8.00E-01	1.86E-06	1.00E-04	2.25E+02	8.70E+00	+
(1)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
1N646	+	+	+	+	+	+	+	+	+	+
(C)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
1N646W	2.20E-10	1.43E+00	3.10E+10	1.60E-11	1.00E+00	9.63E-07	1.00E-04	1.44E+02	2.10E+01	+
(1)	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	CDU	VOB1	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
R BULK	+	+	+	+	+	+	+	+	+	+
FORWARD	+	+	+	+	+	+	+	+	+	+
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
IS	MD	RDL	CDU	VOB1	TD	IPPD	VB	SURGE Z	(TRAC REF)	
1.00E-08	2.28E+00	3.10E+10	1.60E-11	1.00E+00	1.53E-06	1.00E-04	1.44E+02	2.10E+01		
(1)										
IN46Y	2.20E-10	1.43E+00	3.10E+10	1.60E-11	1.00E+00	7.04E-07	1.00E-04	1.44E+02	2.10E+01	
(1)										
IN46Z	1.00E-08	2.28E+00	3.10E+10	1.60E-11	1.00E+00	1.12E-06	1.00E-04	1.44E+02	2.10E+01	
(1)										
IN467	1.60E-09	1.76E+00	4.20E+10	7.70E-12	1.00E+00	8.64E-07	1.00E-04	4.00E+02	1.72E+01	( 61)
(1)										
IN468	2.80E-09	1.84E+00	5.80E+10	6.60E-12	1.00E+00	6.64E-07	1.00E-04	5.00E+02	2.10E+01	
(1)										
IN469	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	3.00E-06	1.00E-04	6.00E+02	2.10E+01	
(1)										
IN469W	1.40E-11	1.15E+00	3.60E+10	1.20E-11	9.00E-01	3.26E-06	1.00E-04	1.44E+02	2.10E+01	
(1)										
IN469X	7.60E-08	2.58E+00	3.60E+10	1.20E-11	9.00E-01	7.33E-06	1.00E-04	1.44E+02	2.10E+01	
(1)										



DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	COU	VDBI	ID	IPPD	VB	SURGE Z	(TRAC REF)
(TSAC FLAG)	+	---	+	---	+	---	+	---	+	---
R BULK	+	---	+	---	+	---	+	---	+	---
FORWARD	+	---	+	---	+	---	+	---	+	---
(REF)	+	---	+	---	+	---	+	---	+	---
IS	+	---	+	---	+	---	+	---	+	---
MD	+	---	+	---	+	---	+	---	+	---
RDL	+	---	+	---	+	---	+	---	+	---
COU	+	---	+	---	+	---	+	---	+	---
VDBI	+	---	+	---	+	---	+	---	+	---
ID	+	---	+	---	+	---	+	---	+	---
IPPD	+	---	+	---	+	---	+	---	+	---
VB	+	---	+	---	+	---	+	---	+	---
SURGE Z	+	---	+	---	+	---	+	---	+	---
(TRAC REF)	+	---	+	---	+	---	+	---	+	---

1N669Y	+	1.40E-11	+	1.15E+00	+	3.60E+10	+	8.60E-12	+	9.00E-01	+	3.26E-06	+	1.00E-04	+	1.44E+02	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N669Z	+	7.60E-08	+	2.58E+00	+	3.60E+10	+	8.60E-12	+	9.00E-01	+	7.33E-06	+	1.00E-04	+	1.44E+02	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N658	+	3.90E-09	+	1.76E+00	+	6.10E+09	+	1.80E-12	+	1.00E+00	+	1.50E-07	+	1.00E-04	+	1.20E+02	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N659	+	1.40E-11	+	1.15E+00	+	5.60E+08	+	2.12E-11	+	8.00E-01	+	8.90E-08	+	1.00E-04	+	5.00E+01	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N660	+	4.80E-09	+	1.82E+00	+	9.90E+08	+	3.40E-12	+	9.00E-01	+	3.24E-07	+	1.00E-04	+	1.00E+02	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N661	+	9.24E-17	+	9.90E-01	+	2.00E+07	+	3.82E-12	+	5.00E-01	+	3.18E-09	+	1.00E-04	+	2.00E+02	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N665	+	7.60E-07	+	1.55E+00	+	3.20E+05	+	7.00E-13	+	6.00E-01	+	1.44E-08	+	1.00E-04	+	2.00E+01	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---
1N706	+	1.39E-13	+	1.12E+00	+	1.00E+16	+	2.50E-10	+	9.00E-01	+	1.00E-07	+	1.00E-04	+	5.80E+00	+	2.10E+01	+	---
(1)	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---	+	---

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	CDD	VORI	TD	IPPD	VB	SURGE Z	+(TRAC REF)
(TRAC FLAG)	R BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV IUS	REV IUS	REV <SONS	REV <SONS	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)				
1N711A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	7.50E+00	1.90E+00	
(1)										
1N746A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.30E+00	2.10E+01	
(1)										
1N747A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.60E+00	2.10E+01	
(1)										
1N748A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.90E+00	2.10E+01	
(1)										
1N751A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	7.00E-01		( 61)
(1)										
1N752A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	5.60E+00	2.10E+01	
(1)										
1N753A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	4.00E-01	
(1)										

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	CDO	VBE1	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	Q BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV 105	REV 105	REV <50NS	REV >50NS	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
IN753A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	4.00E-01	
(1)		4.00E-01			1.48E+01	2.34E-02	1.20E+00			
		( 24)			( 13)	( 13)	( 20)			
IN754A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.80E+00	2.10E+01	
(1)					1.12E+00	6.43E-04	6.30E-01			
					( 13)	( 13)	( 17)			
IN755A	7.26E-10	1.73E+00	1.00E+09	5.00E-12	1.00E+00	1.00E-08	1.00E-03	7.50E+00	5.00E+00	
(1)										
IN756	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	8.20E+00	2.10E+01	
(1)					2.04E+01	6.87E-02	6.30E-01			
					( 13)	( 13)	( 17)			
IN756A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	8.20E+00	2.10E+01	
(1)					6.30E-01					
					( 17)					
IN758	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.00E+01	2.10E+01	
(1)					6.30E-01					
					( 17)					
IN758A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.00E+01	2.10E+01	
(1)					6.17E+00	2.50E-02	6.30E-01			
					( 13)	( 13)	( 17)			
IN758A1	4.20E-14	1.10E+00	2.20E+09	5.38E-10	9.00E-01	1.26E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MD	RDL	CDU	VDB1	ID	IPPD	VB	SURGE Z	*(TRAC REF)
(TRAC FLAG)	K BULK	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV IUS	REV IUS	REV <SONS	REV >SONS	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N75842	7.50E-15	1.01E+00	1.00E+10	3.58E-10	9.00E-01	2.66E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										
1N75843	6.30E-15	1.01E+00	9.80E+09	3.95E-10	9.00E-01	1.80E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										
1N75844	1.60E-14	1.03E+00	9.40E+09	3.66E-10	9.00E-01	1.43E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										
1N75845	1.60E-14	1.03E+00	8.90E+09	3.69E-10	9.00E-01	2.49E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										
1N75846	1.80E-14	1.05E+00	6.50E+09	3.37E-10	9.00E-01	2.38E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										
1N75847	9.42E-12	1.20E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.60E+01	2.00E+01	
(1)										
1N75848	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	7.90E-01	
(1)										
1N75849	7.60E-12	1.26E+00	1.20E+10	1.30E-12	8.00E-01	4.23E-08	1.00E-04	2.00E+01	2.10E+01	
(1)										

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	RDL	COO	VDB1	TD	IPPD	VB	SURGE Z	(TRAC REF)
1N408	5.20E-09	1.92E+00	8.90E+06	1.20E-12	8.00E-01	4.95E-08	1.00E-04	4.00E+01	2.10E+01	
(1)										
1N414	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.59E-08	1.00E-04	1.00E+02	4.00E+01	
(1)										
1N414B	8.70E-10	1.61E+00	1.10E+06	2.40E-12	9.00E-01	1.33E-07	1.00E-04	7.50E+01	8.50E+01	
(1)										
1N414B1	9.51E-09	2.02E+00	4.60E+08	1.14E-12	1.00E+00	3.28E-09	1.00E-04	7.50E+01	2.10E+01	
(1)										
1N414B2	1.10E-08	2.09E+00	5.50E+08	1.28E-12	8.50E-01	3.41E-09	1.00E-04	7.50E+01	2.10E+01	
(1)										
1N414B3	1.10E-08	2.05E+00	5.60E+08	9.40E-13	1.00E+00	3.57E-09	1.00E-04	7.50E+01	2.10E+01	
(1)										
1N414B4	1.00E-08	2.03E+00	4.80E+08	1.18E-12	9.50E-01	3.64E-09	1.00E-04	7.50E+01	2.10E+01	
(1)										
1N414B5	1.15E-08	2.04E+00	5.70E+08	1.23E-12	9.50E-01	2.63E-09	1.00E-04	7.50E+01	2.10E+01	
(1)										

DIODE DEVICE LIBRARY (Cont'd)

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DEVICE NAME	IS	MO	RDL	CDD	VDBI	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	R BULK	SURGE Z	SURGE Z	K DAMAGE	K DAMAGE	K DAMAGE	K	K	K	K
	FORWARD	REV IUS	REV IUS	REV <SONS	REV >SONS	FORWARD	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
1N61486	1.55E-08	2.06E+00	6.30E+08	1.19E-12	9.50E-01	2.87E-09	1.00E-04	7.50E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N6638	1.39E-13	1.12E+00	1.00E+18	3.29E-10	9.00E-01	---	1.00E-04	1.20E+01	1.03E+02	---
(0)	---	---	---	---	---	---	---	---	---	---
1N6658	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.50E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N6678	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.80E+01	1.90E+00	---
(1)	---	---	---	---	---	---	---	---	---	---
1N6738	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.30E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---
1N695	7.30E-07	1.43E+00	4.00E+06	5.66E-12	5.00E-01	2.53E-08	1.00E-04	1.50E+01	2.10E+01	---
(1)	---	---	---	---	---	---	---	---	---	---

END OF LISTING



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DEVICE NAME	MFEN	MFET	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEC	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	E-B	Z SURGE C-B	C-B	Z SURGE E-B	E-B	DAMAGE K (<SONS)	E-B	DAMAGE K (>SONS)	E-B
(REF)	(REF)	(REF)	IUS	IUS	IUS	(REF)	(REF)	(REF)	(REF)	(REF)
K FORWARD	K	K	C-B	K	K	K	K	K	K	K
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2N1016P	2.87E+01	7.49E+00	2.03E-07	1.76E-06	8.22E-10	1.11E+00	1.75E-09	7.00E-01	1.00E+07	2.78E-10
(1)	1.02E+00	4.00E-10	1.00E+07	1.00E-03	1.00E-05	1.00E-05	1.00E+02	2.50E+01	2.10E+01	6.20E+00
2N1016E	1.60E+01	4.79E+00	3.29E-07	2.40E-06	1.87E-10	1.03E+00	1.85E-09	7.00E-01	1.00E+07	6.70E-11
(1)	9.72E-01	3.91E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	2.50E+01	2.10E+01	6.20E+00
2N1037	5.00E+00	5.00E+00	5.31E-07	1.59E-06	1.00E-06	9.94E-01	9.19E-11	5.00E-01	1.00E+07	1.00E-06
(1)	9.94E-01	1.41E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	2.00E+01	2.10E+01	2.10E+01
2N1039	1.00E+01	5.00E+00	1.99E-05	1.59E-04	6.00E-09	9.94E-01	2.12E-10	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-09	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	2.00E+01	2.10E+01	2.85E+02

[illegible]

DEVICE NAME	HFEN	HFEL	TN	TI	ICS	MC	CCU	VCBI	RCL	IES
INTRAC FLAG	ME	CEB	VEB1	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	E-B	Z SURGE	C-B	Z SURGE	E-B	DAMAGE K (<SONS)	E-B	DAMAGE K (>SONS)	E-B
(REF)	(REF)	(REF)	IUS	IUS	IUS	(REF)	C-B	(REF)	C-B	(REF)
K FORWARD	K	K	C-B	K	C-B	K	K	K	K	K
C-B	C-B	E-B	C-B	E-B	C-B	E-B	(REF)	(REF)	(REF)	(REF)
2N1184 Y	6.80E+01	7.47E+00	7.69E-08	1.50E-07	1.13E-05	9.68E-01	2.40E-10	4.00E-01	1.00E+07	8.12E-06
(1)	8.23E-01	2.00E-10	4.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	2.00E+01	2.00E+02	1.40E+02
2.00E-01	3.00E-01	( 32)	( 32)	1.40E+02	( 32)	2.00E+02				
2N1225	3.00E+01	3.50E-01	9.62E-09	1.12E-07	5.40E-07	1.11E+00	3.10E-12	4.00E-01	1.00E+07	1.23E-07
(1)	1.05E+00	3.30E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E-01	2.10E+01	2.10E+01
2N1289	2.00E+01	9.00E+00	3.98E-09	1.59E-08	6.00E-09	9.94E-01	1.41E-11	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N1301	1.50E+01	5.00E+00	4.55E-09	1.59E-08	1.02E-10	9.94E-01	1.70E-11	5.00E-01	1.00E+07	1.02E-10
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

		PAGE 5																									
DEVICE NAME	HFEN	HFEL	TN	TI	ICS	MC	CCD	VCBI	RCL	IES	(TRAC FLAG)	ME	CEC	VERI	REL	IPPC	IPPE	C-BDV	E-BDV	SURGE ZC	SURGE ZF	DAMAGE K (>50NS)	DAMAGE K (<50NS)	E-B	(REF)	K	(REF)
2N1304	7.00E+01	5.00E+00	1.99E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07	(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-05	1.00E+01	2.50E+01	2.50E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
2N1306	1.00E+02	5.00E+00	1.33E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07	(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-05	1.00E+01	2.50E+01	2.50E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
2N1307	1.00E+02	5.00E+00	1.33E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07	(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-05	1.00E+01	2.50E+01	2.50E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
2N1308	1.50E+02	5.00E+00	7.96E-09	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07	(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-05	1.00E+01	2.50E+01	2.50E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01

[illegible]



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## TRANSISTOR DEVICE LIBRARY (Cont'd)

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DEVICE NAME	HTEN	HFEL	TN	TI	ICS	MC	CCU	VCBI	RCL	IES
(TRAC FLAG)	ME	CEC	VEBI	REL	IPPC	IPPE	C-BBOV	E-BBOV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE	C-B	Z SURGE	E-B	DAMAGE K (<SONS)	E-B	DAMAGE K (>SONS)	
	(C-B)	E-B	10US	10US	10US	10US	C-B	E-B	C-B	E-B
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
	K FORWARD		C-B	K	C-B	K	K	K	K	K
	(C-B)	E-B	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2421900	1.36E+02	1.37E+00	1.69E-09	1.08E-06	2.32E-11	1.02E+00	1.80E-09	7.00E-01	1.00E+07	1.60E-11
(1)	1.02E+00	7.00E-09	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.40E+02	5.00E+00	2.10E+01	2.10E+01
2422048	2.50E+01	9.00E+00	6.12E-10	1.59E-08	4.00E-09	9.94E-01	2.12E-12	5.00E-01	1.00E+07	4.00E-09
(1)	9.94E-01	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+00	2.10E+01	2.10E+01
2422060	1.00E+00	2.00E-01	8.00E-10	6.17E-07	1.20E-13	1.08E+00	3.48E-11	9.00E-01	1.00E+07	2.60E-13
(1)	1.01E+00	6.60E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	7.00E+00	2.10E+01	2.10E+01
2422087	2.00E+01	9.00E+00	1.06E-09	3.18E-09	1.62E-12	9.94E-01	1.70E-11	5.00E-01	1.00E+07	4.86E-14
(1)	9.94E-01	9.90E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	5.00E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

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DEVICE NAME	HFEN	HFEL	IN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
ME	+	+	+	+	+	+	+	+	+	+
BULK RESISTANCE	+	+	+	+	+	+	+	+	+	+
C-B	+	+	+	+	+	+	+	+	+	+
(REF)	+	+	+	+	+	+	+	+	+	+
N FORWARD	+	+	+	+	+	+	+	+	+	+
C-B	+	+	+	+	+	+	+	+	+	+
(REF)	+	+	+	+	+	+	+	+	+	+
2N2102	4.83E+01	3.20E-01	2.84E-10	4.84E-07	1.16E-12	1.04E+00	1.03E+00	8.00E-01	1.00E+07	2.85E-13
(1)	1.04E+00	4.40E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	7.00E+00	2.10E+01	2.10E+01
2N2107	3.50E+01	6.10E-01	1.94E-09	6.43E-09	5.67E-13	1.07E+00	7.80E-12	7.00E-01	1.00E+07	5.67E-14
(1)	9.25E-01	5.40E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	3.00E+01	3.00E+01	2.10E+01	2.10E+01
2N2108	6.00E+01	7.00E+00	1.77E-09	3.18E-08	1.00E-05	1.82E+00	2.26E-12	5.00E-01	1.00E+07	1.00E-05
(0)	1.82E+00	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	2.00E+00	2.10E+01	2.10E+01
2N2192	1.95E+02	7.00E+00	8.16E-10	1.05E-07	9.49E-13	1.02E+00	2.10E-11	8.00E-01	1.00E+07	1.31E-13
(1)	9.21E-01	3.90E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01





## TRANSISTOR DEVICE LIBRARY (Cont'd)

[illegible]

DEVICE NAME	MFEN	NEEL	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEU	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
BULK RESISTANCE			Z SURGE	C-B	Z SURGE	E-B	DAMAGE K (<SONS)		DAMAGE K (>SONS)	
C-B			IUS	IUS	IUS	IUS	C-B	E-B	C-B	E-B
(REF)			(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
K FORWARD			K	K	K	K	K	K	K	K
C-B			C-B	(REF)	C-B	(REF)	(REF)	(REF)	(REF)	(REF)
242411	2.86E+01	4.10E-01	6.76E-10	5.24E-08	1.75E-15	9.82E-01	5.30E-12	8.00E-01	1.00E+07	6.06E-16
(1)	9.82E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E+00	2.10E+01	2.10E+01
242461	5.78E+01	2.00E-02	4.03E-10	3.36E-09	1.86E-12	1.05E+00	4.00E-12	8.00E-01	1.00E+07	8.95E-15
(1)	9.44E-01	5.50E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
242538	1.15E+02	1.50E+00	3.47E-10	2.40E-07	6.00E-13	1.08E+00	6.90E-12	8.00E-01	1.00E+07	1.20E-14
(1)	9.44E-01	1.90E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
242656	9.52E+01	1.00E+00	3.96E-10	3.30E-07	3.00E-14	1.02E+00	5.80E-12	8.00E-01	1.00E+07	4.85E-15
(1)	9.68E-01	4.30E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E+00	2.10E+01	2.10E+01

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[illegible]

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DEVICE NAME	HFEN	HFET	IN	TI	ICS	MC	CCD	VGB1	RCL	IES
(TAC FLAG)	ME	CEQ	VERI	REL	IPPC	IPPE	C-BBOV	E-BBOV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	E-B	Z SURGE C-B	Z SURGE C-B	Z SURGE C-B	Z SURGE E-B	DAMAGE K (<50MS)	DAMAGE K (<50MS)	DAMAGE K (>50MS)	DAMAGE K (>50MS)
(REF)	(REF)	(REF)	10US	10US	10US	10US	C-B	E-B	C-B	E-B
K FORWARD	K	K	K	K	K	K	K	K	K	K
C-B	(REF)	E-B	C-B	E-B	C-B	E-B	(REF)	(REF)	(REF)	(REF)
2V297 Y	1.00E+01	5.00E+00	3.70E-07	1.59E-06	5.00E-09	9.94E-01	1.41E-10	5.00E-01	1.00E+07	5.00E-09
(1)	9.94E-01	1.41E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	4.00E+01	7.30E+01	7.30E+01
2V298 G	2.86E+01	4.10E-01	6.76E-10	5.24E-08	1.75E-15	9.82E-01	5.30E-12	8.00E-01	1.00E+07	6.06E-16
(1)	9.82E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	3.00E+00	2.10E+01	2.10E+01
2V301 B	6.30E+01	2.50E-01	1.97E-10	7.60E-09	1.60E-12	1.25E+00	3.48E-12	9.00E-01	1.00E+07	4.27E-15
(1)	9.92E-01	6.01E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	1.51E+01	9.50E+00
2V301 C	1.45E+00	1.65E+00	3.85E+02	7.50E+02	9.50E+00	9.50E+00	3.82E-06	5.80E-06	1.71E-02	2.59E-02
(1)	5.50E-05	2.40E-05	(34)	(34)	(34)	(34)	(60)	(60)	(60)	(60)
2V301 F	6.03E+01	4.59E+00	1.28E-09	8.97E-06	8.64E-13	9.92E-01	1.70E-10	9.00E-01	1.00E+07	8.00E-13
(1)	1.02E+00	4.80E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	4.00E+00	2.10E+01	2.10E+01

[illegible]



DEVICE NAME	HFEN	AFET	TN	LI	ICS	MC	CCO	VCR1	RCL	IES
(TAC FLAG)	ME	CEO	VER1	REL	TPPC	IPPE	C-BBV	E-BDV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	Z SURGE	C-B	Z SURGE	Z SURGE	E-B	DAMAGE K	DAMAGE K	DAMAGE K	DAMAGE K
C-S	REF	REF	REF	REF	REF	REF	C-B	E-B	C-B	E-B
K FORWARD	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
C-B	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
2N3244	1.15E+02	2.10E+00	4.96E-10	5.01E-08	1.02E-13	9.92E-01	4.30E-11	8.00E-01	1.00E+07	1.71E-13
(1)	1.02E+00	5.50E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N3251	1.66E+02	6.80E-01	2.59E-10	4.86E-08	1.19E-13	1.08E+00	6.50E-12	9.00E-01	1.00E+07	4.02E-15
(1)	9.68E-01	4.80E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	5.00E+00	2.10E+01	2.10E+01
2N3252	8.23E+01	8.00E-02	4.94E-10	3.70E-09	2.84E-12	1.03E+00	1.40E-11	8.00E-01	1.00E+07	5.16E-14
(1)	9.68E-01	5.50E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N325A	1.00E+01	5.00E+00	1.99E-05	1.59E-04	6.00E-09	9.94E-01	2.12E-10	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-09	5.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	2.00E+01	2.10E+01	1.60E+01



DEVICE NAME	HEEN	HFEL	IN	TI	ICS	MC	CCO	VCBI	RCL	IES
(IT+AC FLAG)	ME	CEC	VEBI	REL	IPPC	IPPE	C-BBDV	E-BROV	SURGE ZC	SURGE ZE
BULK RESISTANCE	+	+	+	+	+	+	+	+	DAMAGE K (>SONS)	DAMAGE K (>SONS)
C-B	+	+	+	+	+	+	+	+	C-B	E-B
(REF)	+	+	+	+	+	+	+	+	(REF)	(REF)
K FORWARD	+	+	+	+	+	+	+	+	+	K
C-B	+	+	+	+	+	+	+	+	+	(REF)
(REF)	+	+	+	+	+	+	+	+	+	(REF)
2N335	7.71E+01	1.11E+00	2.54E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	2.92E-12
(1)	1.05E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	1.00E+00	2.10E+01	1.30E+01
2N336	7.71E+01	1.11E+00	5.13E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	6.40E-09
(1)	2.13E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	1.00E+00	2.10E+01	1.00E+01
2N336A	7.71E+01	1.11E+00	2.54E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	2.92E-12
(1)	1.05E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N336Y	7.71E+01	1.11E+00	5.13E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	6.40E-09
(1)	2.13E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01



DEVICE NAME	HFEN	HFEL	TN	TI	ICS	MC	CCC	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VERI	REL	IPPC	IPPE	C-BBOV	E-BBOV	SURGE ZC	SURGE ZE
BULK RESISTANCE			Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
C-B (REF)			IUS (REF)	IUS	IUS (REF)		C-B (REF)	E-B	C-B (REF)	E-B
K FORWARD			K	K	K		K	K	K	K
C-B (REF)			C-B (REF)	E-B	C-B (REF)	E-B	(REF)	(REF)	(REF)	(REF)
2N3499	1.08E+02	6.00E-01	5.94E-10	2.25E-07	6.93E-13	1.05E+00	2.40E-11	1.00E+00	1.00E+07	5.35E-14
(1)	9.92E-01	1.60E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3509	1.53E+02	2.64E-01	1.29E-10	1.17E-08	4.07E-14	1.01E+00	2.95E-12	9.00E-01	1.00E+07	2.97E-15
(1)	9.68E-01	3.48E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	6.00E+00	2.10E+01	2.10E+01
2N3553	3.41E+01	5.34E+00	2.65E-09	3.87E-08	1.97E-14	1.04E+00	2.94E-11	8.00E-01	1.00E+07	1.36E-13
(1)	1.01E+00	1.04E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	6.50E+01	4.00E+00	2.10E+01	2.10E+01
2N3556	1.50E+01	5.00E+00	5.31E-08	1.99E-07	4.00E-09	9.94E-01	1.98E-11	5.00E-01	1.00E+07	4.00E-09
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+01	2.10E+01	2.10E+01

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DEVICE NAME (TRAC FLAG)	MFEN	MFEL	TN	TI	ICS	MC	CCU	VCBI	RCL	IES
	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<SONS)		DAMAGE K (>SONS)	
	C-B	E-B	1US	10US	1US	10US	C-B	E-B	C-B	E-B
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
	K FORWARD		K	K	K	K	K	K	K	K
	C-B	E-B	C-B	E-B	C-B	E-B	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2N3723B	1.30E+01	5.00E-02	4.18E-09	3.14E-09	1.01E-10	1.17E+00	1.30E-11	1.00E+00	1.00E+07	1.40E-12
(1)	1.07E+00	6.48E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723C	1.73E+01	1.07E+00	3.12E-09	3.77E-08	6.96E-12	1.19E+00	1.34E-11	8.00E-01	1.00E+07	5.08E-13
(1)	1.06E+00	7.60E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723D	1.13E+01	7.61E-01	3.03E-09	3.46E-08	4.17E-14	1.07E+00	7.76E-12	7.80E-01	1.00E+07	4.68E-15
(1)	1.01E+00	1.65E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723E	1.08E+01	7.17E-01	5.13E-09	3.17E-08	1.10E-10	1.19E+00	9.84E-12	8.00E-01	1.00E+07	2.51E-12
(1)	1.12E+00	6.26E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01



DEVICE NAME	MFEN	MFEL	TN	TI	ICS	MC	CCO	VCB1	RCL	IES
(TRAC FLAG)	NE	CEO	VERI	REL	IPPC	IPPE	C-BBOV	E-BBOV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	E-B	Z SURGE C-B	LOUS	Z SURGE E-B	LOUS	DAMAGE K (C-B)	DAMAGE K (E-B)	DAMAGE K (>SONS)	E-B
(REF)	(REF)	(REF)	LOUS	(REF)	LOUS	(REF)	(REF)	(REF)	(REF)	(REF)
K FORWARD	C-B	E-B	C-B	E-B	C-B	E-B	K	K	K	K
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2N3723F	1.34E+01	7.78E-01	3.24E-09	2.81E-08	5.71E-12	1.14E+00	9.62E-12	8.00E-01	1.00E+07	3.22E-13
(1)	1.01E+00	6.04E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3828	2.40E+01	2.10E+00	2.88E-08	4.06E-08	1.40E-13	1.02E+00	6.80E-12	7.50E-01	1.00E+07	3.10E-14
(1)	1.02E+00	1.80E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	3.00E+00	2.10E+01	2.10E+01
2N3866	1.00E+00	1.00E-01	8.10E-10	1.61E-08	1.39E-13	9.80E-01	5.70E-11	8.00E-01	1.00E+07	1.26E-14
(1)	1.05E+00	1.03E-10	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866A	8.50E+00	2.30E+00	8.46E-10	4.74E-08	1.02E-14	1.06E+00	7.56E-12	8.20E-01	1.00E+07	5.59E-15
(1)	1.04E+00	1.42E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	HFEN	HFEL	TN	TI	ICS	MC	CCU	VCBI	RCL	IES
	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBOV	E-BBOV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)		1US	10US	1US	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD			K	C-B	K		K		K
	C-B (REF)		C-B (REF)	E-B	C-B (REF)	E-B		(REF)		(REF)
2N3866B	5.20E+00	2.00E+00	1.31E-09	4.17E-08	1.65E-14	1.06E+00	8.06E-12	8.20E-01	1.00E+07	6.44E-15
(1)	1.05E+00	1.56E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866C	6.60E+00	2.41E+00	1.22E-09	2.73E-08	6.37E-13	1.31E+00	7.36E-12	7.80E-01	1.00E+07	7.25E-15
(1)	1.04E+00	1.51E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866D	7.10E+00	3.40E+00	8.77E-10	4.36E-08	2.33E-14	1.07E+00	7.76E-12	7.80E-01	1.00E+07	4.91E-15
(1)	1.01E+00	1.65E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866E	8.30E+00	5.00E+00	8.70E-10	1.69E-08	9.60E-15	1.06E+00	8.05E-12	8.00E-01	1.00E+07	2.02E-15
(1)	9.90E-01	1.74E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01



DEVICE NAME	HFEN	HFEL	IN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEB	VERI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50MS)		DAMAGE K (>50MS)	
	C-B		10US		10US		C-B		C-B	E-B
	(REF)		(REF)		(REF)		(REF)		(REF)	
	K FORWARD		K		K		K		K	
	C-B		C-B		C-B		(REF)		(REF)	
2N404	6.00E+01	9.00E+00	3.98E-08	1.59E-07	5.00E-07	1.21E+00	2.83E-11	5.00E-01	1.00E+07	5.00E-07
(1)	1.21E+00	2.83E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	1.20E+01	2.10E+01	2.10E+01
2N4209	5.80E+01	8.80E-01	1.47E-10	6.93E-09	5.49E-15	1.04E+00	2.86E-12	8.00E-01	1.00E+07	3.45E-14
(1)	1.13E+00	2.76E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209A	4.01E+01	1.33E+00	1.37E-10	1.08E-08	5.61E-14	1.15E+00	2.68E-12	8.00E-01	1.00E+07	2.56E-15
(1)	1.03E+00	2.71E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209B	4.29E+01	1.32E+00	1.17E+10	7.97E-09	5.62E-14	1.15E+00	2.68E-12	8.00E-01	1.00E+07	2.56E-15
(1)	1.03E+00	2.71E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01



TRANSISTOR DEVICE LIBRARY (Cont'd)

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DEVICE NAME	HFEN	HFEL	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEU	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZF
BULK RESISTANCE			Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
C-B (REF)			IUS	IUS	IUS	IUS	C-B (REF)	E-B (REF)	C-B (REF)	E-B (REF)
K FORWARD			K	K	K	K	K	K	K	K
C-B (REF)			C-B (REF)	E-B (REF)	C-B (REF)	E-B (REF)	C-B (REF)	E-B (REF)	C-B (REF)	E-B (REF)
2N4251A	1.83E+02	1.92E+01	4.48E-11	2.85E-09	3.37E-11	1.48E+00	4.04E-12	7.50E-01	1.00E+07	1.01E-12
(1)	1.20E+00	4.99E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251E	1.72E+02	1.75E+01	4.57E-11	2.65E-09	3.38E-14	1.06E+00	4.12E-12	8.50E-01	1.00E+07	4.02E-14
(1)	1.06E+00	5.21E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251C	1.70E+02	1.84E+01	4.47E-11	2.85E-09	1.48E-14	1.01E+00	3.58E-12	7.50E-01	1.00E+07	2.51E-13
(1)	1.19E+00	4.92E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251D	1.59E+02	1.60E+01	4.47E-11	3.11E-09	3.93E-14	1.02E+00	3.52E-12	8.00E-01	1.00E+07	3.72E-14
(1)	1.07E+00	4.80E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01

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## TRANSISTOR DEVICE LIBRARY (Cont'd)

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DEVICE NAME	HFE1	VEB1	REL	MC	ICS	IPPC	IPPE	CCU	VCB1	RCL	IES
2N457	1.00E+01	9.00E+00	1.27E-07	1.59E-06	6.98E-15	9.94E-01	2.47E-10	5.00E-01	1.00E+07	6.98E-15	
(C)	9.94E-01	2.47E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	8.00E+00		3.20E+00	
2N458	2.00E+01	5.00E+00	1.77E-09	1.59E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N467	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N468	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N469	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N470	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N471	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N472	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N473	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N474	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+00	
2N475	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17	
(C)	1.83E+00	6.39E-12	3.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	3.50E+00	7.25E+01	1.65E+02	
2N476	9.50E-01	2.20E+00	1.50E+02	3.60E+02	3.40E+02	3.40E+02	3.40E+02	1.13E-06	1.42E-02	5.06E-03	
( 34)	( 34)	( 34)	( 34)	( 34)	( 34)	( 34)	( 34)	( 60)	( 60)	( 60)	
2N477	7.90E-05	3.60E-05									
( 60)	( 60)	( 60)									

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DEVICE NAME	HREN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL
(TRAC FLAG)	+	-	+	+	IPPC	+	+	+	IES
NE	CED	REL	+	+	IPPE	E-BROV	SURGE ZC	+	SURGE ZE
BULK RESISTANCE	E-B	Z SURGE C-B	+	+	Z SURGE E-B	DAMAGE K (<SONS)	DAMAGE K (>SONS)	+	+
C-B	(REF)	IUS	+	+	IUS	IOUS	C-B	E-B	E-B
K	FLOWAREL	(REF)	+	+	(REF)	(REF)	(REF)	(REF)	(REF)
C-B	E-B	K	+	+	K	E-B	K	K	K
(REF)	(REF)	C-B	+	+	C-B	(REF)	(REF)	(REF)	(REF)

2706	8.99E+01	1.20E-01	1.88E-10	1.28E-08	7.37E-13	1.11E+00	4.50E-12	1.00E+00	1.00E+07	1.01E-14
(1)	9.62E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	3.00E+00	1.65E+01	2.50E+01
	2.15E+00	2.44E+00	4.70E+01	7.30E+01	2.50E+01	2.50E+01	4.25E-06	3.96E-06	1.80E-02	1.77E-02
	(34)	(34)	(34)	(34)	(34)	(34)	(60)	(60)	(60)	(60)
	4.30E-05	8.80E-05								
	(60)	(60)								

[illegible]

2N711A	$\pm 1.25\text{E}+01$	$\pm 9.00\text{E}+00$	$\pm 1.06\text{E}-09$	$\pm 1.59\text{E}-08$	$\pm 6.67\text{E}-12$	$\pm 9.94\text{E}-01$	$\pm 8.49\text{E}-12$	$\pm 5.00\text{E}-01$	$\pm 1.00\text{E}+07$	$\pm 6.67\text{E}-12$
(1)	$\pm 9.94\text{E}-01$	$\pm 1.41\text{E}-11$	$\pm 5.00\text{E}-01$	$\pm 1.00\text{E}+07$	$\pm 1.00\text{E}-03$	$\pm 1.00\text{E}-05$	$\pm 6.00\text{E}+01$	$\pm 5.00\text{E}+01$	$\pm 2.10\text{E}+01$	$\pm 2.10\text{E}+01$

[illegible]

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DEVICE NAME	FEV	HEF	IN	TI	ICS	MC	CCD	VGB	RCL	IES
(TSAC FLAG)	ME	CEU	VERI	REL	IPPC	IPPE	C-BDV	E-BDV	SURGE ZC	SURGE ZE
BULK RESISTANCE	C-B	E-B	IUS	C-B	Z SURGE	E-B	DAMAGE K (<50MS)	E-B	DAMAGE K (>50MS)	E-B
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
K FORWARD	K	K	(C-B)	K	(C-B)	K	K	K	K	K
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2N760	5.39E+01	1.20E+01	4.46E-10	1.52E-08	3.89E-11	1.29E+00	4.20E-12	7.00E-01	1.00E+07	3.23E-13
(1)	9.80E-01	7.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	8.00E+00	2.10E+01	2.10E+01
2N767	2.00E+01	5.00E+00	2.65E-10	1.59E-09	3.37E-10	9.94E-01	5.66E-12	5.00E-01	1.00E+07	3.37E-13
(1)	9.94E-01	5.66E-12	5.10E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	2.00E+01	2.10E+01	2.10E+01
2N764	6.27E+01	7.20E+00	4.53E-10	4.92E-08	1.14E-14	1.02E+00	7.30E-12	9.00E-01	1.00E+07	1.32E-15
(1)	9.46E-01	6.00E-12	6.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N765	3.40E+01	1.00E+01	9.03E-10	5.00E-08	1.20E-13	1.08E+00	5.00E-12	8.00E-01	1.00E+07	3.60E-15
(1)	9.94E-01	7.20E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	3.00E+00	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEL	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VERI	REL	IPPC	IPPE	C-BDV	E-BDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50MS)		DAMAGE K (>50MS)	
	C-B	E-B	IUS	IUS	IUS	IUS	C-B	E-B	C-B	E-B
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
	K FORWARD		K	K	K	K	K	K	K	K
	C-B	E-B	C-B	E-B	C-B	E-B	(REF)	(REF)	(REF)	(REF)
	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)
2N914	2.60E+01	1.10E-01	3.66E-10	1.19E-08	2.62E-13	1.05E+00	4.70E-12	9.00E-01	1.00E+07	6.54E-15
(1)	9.92E-01	5.90E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N915	1.07E+02	3.30E-01	5.15E-10	4.46E-07	3.75E-11	1.43E+00	4.60E-12	8.00E-01	1.00E+07	6.66E-15
(1)	9.68E-01	7.10E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	7.00E+01	5.00E+00	2.10E+01	2.10E+01
2N916	9.16E+01	3.50E-01	5.05E-10	3.89E-07	1.93E-13	1.11E+00	6.70E-12	9.00E-01	1.00E+07	4.95E-15
(1)	9.92E-01	7.30E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	5.00E+00	2.10E+01	2.10E+01
2N918	4.38E+01	1.00E+00	1.76E-11	2.25E-08	3.20E-15	1.02E+00	2.40E-12	1.00E+00	1.00E+07	1.65E-15
(1)	1.02E+00	1.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	3.00E+01	3.00E+00	2.10E+01	2.10E+01



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DEVICE NAME	MEN	HFEI	TN	T1	ICS	MC	CCU	VCI	RCL	IES
(TRAC FLAG)	ME	CEI	VEDI	REL	IPPC	IPE	C-BDV	E-BDV	SURGE ZC	SURGE ZE
BULK RESISTANCE	+	+	+	+	+	+	DAMAGE K (<SONS)	DAMAGE K (>SONS)	DAMACE K	E-B
(C-B)	(REF)	(REF)	1US	10US	Z SURGE C-B	1US	C-B	E-B	C-B	(REF)
(K FORWARD E-B)	+	+	+	+	+	+	+	+	+	K
(C-B)	+	+	+	+	+	+	+	+	+	(REF)
(K FORWARD E-B)	+	+	+	+	+	+	+	+	+	(REF)
2N9726B	1.23E+02	1.37E+00	2.48E-10	1.39E-07	3.63E-12	1.27E+00	9.81E-12	7.50E-01	1.00E+07	8.07E-14
(1)	1.06E+00	8.72E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726C	1.38E+02	2.02E+00	2.48E-10	1.34E-07	8.07E-12	1.33E+00	9.35E-12	7.50E-01	1.00E+07	4.23E-14
(1)	1.21E+00	8.72E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726E	1.75E+02	1.50E-02	1.99E-10	2.96E-09	1.69E-11	1.14E+00	1.01E-11	8.00E-01	1.00E+07	2.21E-14
(1)	9.75E-01	8.33E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726F	9.88E+01	1.78E+00	3.86E-10	1.15E-07	3.90E-13	1.14E+00	9.84E-12	8.00E-01	1.00E+07	2.53E-14
(1)	1.01E+00	8.64E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01

# TRANSISTOR DEVICE LIBRARY (Cont'd)

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DEVICE NAME	HFEN	HFEL	IN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	+	+	+	+	+	+	+	+	+	+
ME	CEU	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE	
BULK RESISTANCE		Z SURGE C-B	IOUS	Z SURGE E-B	IOUS	DAMAGE K (<50NS)	E-B	DAMAGE K (>50NS)		
C-B	E-B	IOUS	IOUS	IOUS	IOUS	C-B	(REF)	C-B	E-B	
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	
K FORWARD		K	K	K	K	K	K	K	K	
C-B	E-B	C-B	E-B	C-B	E-B	(REF)	(REF)	(REF)	(REF)	
(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	(REF)	

2N976	8.00E+01	2.00E+00	1.77E-10	3.18E-09	1.10E-06	1.22E+00	2.69E-12	6.65E-01	1.00E+07	1.14E-06
(1)	1.22E+00	4.90E-12	8.62E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	2.00E+00	2.10E+01	2.10E+01
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+

END OF LISTING

TABLE III. DEVICE PARAMETER REFERENCES

<u>CODE</u>	<u>REPORT</u>
001	Preliminary Report--Semiconductor Damage Study, Braddock, Dunn, & McDonald (23 December 1968).
002	D. C. Wunsch and L. Marzetelli, BDM Final Report Volume 1, Semiconductor and Non-Semiconductor Damage Study, Braddock, Dunn, & McDonald 375-69-F-0168 (April 1969).
003	J. B. Singletary and D. C. Wunsch, Final Report on Semiconductor Damage Study Phase II, Braddock, Dunn, & McDonald/A-6670-TR (June 1970).
004	Braddock, Dunn, & McDonald, Final Summary Report on Semiconductor Damage Study Phase II, BDM/A-84-70-TR (February 1971).
005	D. C. Wunsch et al, Semiconductor Vulnerability Phase II Report, Theoretical Estimates of Failure Levels of Selected Semiconductor Diodes & Transistors, AFWL-TR-73-119, Vol 1 (July 1973).
006	D. C. Wunsch, R. L. Cline, and G. R. Case, Semiconductor Vulnerability Phase II Report, Braddock, Dunn, & McDonald/A-42-69-R (December 1969).
007	J. B. Singletary, W. O. Collier, and J. A. Meyers, Semiconductor Vulnerability Phase III Report, Braddock, Dunn, & McDonald/A-75-70-TR (August 1970).
010	D. L. Durgin et al, Methods, Devices, and Circuits for the EMP Hardening of Army Electronics, ECOM-0275-F, Braddock, Dunn, & McDonald/A-119-72-TR (July 1972).
011	Boeing Aerospace Company and Braddock, Dunn, & McDonald, EMP Susceptibility of Semiconductor Components, Boeing, Braddock, Dunn, & McDonald/A-110-74-TR (September 1974).
012	Braddock, Dunn, & McDonald and Boeing Co., Addendum to EMP Susceptibility of Semiconductor Components, D224-13042-2 (July 1975).
013	Braddock, Dunn, & McDonald and Boeing Co., Electromagnetic Susceptibility of Semiconductor Components, Final Report (September 1975).

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

<u>CODE</u>	<u>REPORT</u>
014	G. Brown et al, Experimental Damage Constant Summary--Braddock, Dunn, & McDonald/A-99-74-TR-R1 (20 September 1974).
015	Diode and SCR--D.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1970).
016	Transistor--D.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1969).
017	SAP-1 Computer Listing. Data as reported in DASA Handbook (1972).
020	Experimental data from DASA EMP Handbook. DASA 2114-1 (September 1968).
021	Estimated data from DASA EMP Handbook. DASA 2114-1 (September 1968).
022	Calculated as per Section III of DNA EMP Handbook (1972).
023	DNA EMP Handbook (September 1975).
024	Joe Miletta, EMP Effects on Components, internal memo, Harry Diamond Laboratories.
025	Joe Miletta, LANCE System Component Damage Characterizations, internal memo, Harry Diamond Laboratories.
026	D. M. Tasca, Submicrosecond Pulse Power Failure Modes in Semiconductor Devices, General Electric Company, Re-Entry & Environmental Systems Division, Document No. 70SD401 (January 1970).
027	D. M. Tasca, Energy-Time Dependence of Second Breakdown in Semiconductors for Submicrosecond Electrical Pulses, General Electric Company, Missile and Space Division, Document No. 67SD7253 (October 1967).
030	D. M. Tasca, J. Peden, and J. Andrews, Theoretical and Experimental Studies of Semiconductor Device Degradation due to high Power Electrical Transients, GE Document No. 73SD4289 (December 1973).
031	Bruno Kalab, Analysis of Failure of Electronic Circuits from EMP-Induced Signals, Harry Diamond Laboratories TR-1615 (August 1973).

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

<u>CODE</u>	<u>REPORT</u>
032	G. Baker, EMP Vulnerability Analysis of M-109, M-110 Self-Propelled Howitzers, Harry Diamond Laboratories TR-1797, to be published.
033	G. Baker, EMP Vulnerability Analysis of Radio Sets AN/PRC-77, AN/VRC-64 and AN/GRC-160 (U), Harry Diamond Laboratories TR-1747 (February 1976). (SECRET RESTRICTED DATA)
034	G. Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1, Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)
035	See Ref 034.
050	J. D. Holder and V. Ruwe--Statistical Component Damage Study, U.S. Army Missile Command Report RG-TR-71-1 (January 1971).
051	Pete Stadler, Failure Threshold and Resistance of the Protected and Unprotected 2N2222 Transistor in the Short Pulse Width Regime, Philco-Ford Corp, U-4976 (May 1972).
052	EMP Electronic Design Handbook, Boeing Aerospace Corporation D224-10019-1 (April 1973).
053	C. R. Jenkins and J. A. Meyers, Integrated Circuits Test Program, Final Report, Word Order 2-14, Braddock, Dunn, & McDonald/A-98-73-TR (July 1973).
054	D. R. Alexander, T. J. Zwolinski, and C. R. Jenkins, Integrated Circuits and Discrete Semiconductor Components Test Program, Technical Directive 4-6, BDM Monthly Progress Reports (January, February, and March 1974).
055	J. S. Smith, Pulse Power Testing of Microcircuits, Rome Air Development Center TR-71-59 (October 1971).
056	The Boeing Company, Memorandum No. 2-6731-0000-C/S-102, Subject: Pulse Damage Data from Integrated Circuits and Electronic Parts (26 September 1973).
057	G. J. Rimbert et al, Resistor Modeling Program, BDM Final Report, ASV Work Order 2-14 [n.d.].
060	See Ref 034.

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

<u>CODE</u>	<u>REPORT</u>
061	Data value from our previous data base at MERADCOM.
062	See Ref 034.
063	Forward biased damage constant from graph in DNA Handbook (1972).
064	Weighted average from Ref 013.
065	Averaged from Ref 013.
066	These data are from Ref 034, but conflicting values were obtained from Ref 025.
067	D. Tacsá, J. Peden, and D. Nepveux, Pulsed Power Failure Modes: Conference Proceedings, Component Degradation from Transient Inputs (April 1970).
070	Data derived by averaging the means of data in Ref 067.
071	Data from Ref 034 and 062.
777	UNKNOWN



# APPENDIX A.--JCL FOR EXECUTING DAMTRAC AT HDL

The following is the JCL (job control language) necessary to execute DAMTRAC on the HDL IBM 370/168.

DAMTRAC

```
//JOB CARD
//stepname EXEC FORTPLG,PARM.LKED=LET, COND.GO=(8,LT),
//      PRELIB='library name'
//LKED.SYSIN DD *
      INCLUDE SYSLIB(TRAC,BLKDAT)
      ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO,SPACE=(TRK,(1,1)),DISP=(NEW),DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=80),SPACE=(80,(100,50))
//GO.FT11F001 DD DSN='diode library', DISP=SHR
//GO.FT12F001 DD DSN='transistor library',DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN DD *
```

TRAC piece part data deck

/\*

The following is the JCL necessary to execute DAMTRAC with a user-written TREAQ subroutine on the HDL IBM 370/168.

DAMTRAC JCL w/TREAQ

```
//JOB CARD
//stepname EXEC FORTPC

      user written TREAQ subroutine

/*
//stepname EXEC FORTPLG,PARM.LKED=LET,COND.GO=(8,LT),
      PRELIB='library name'
```

APPENDIX A

```
//LKED.SYSLIN DD DSN=&&LOADSET,DISP=(OLD,PASS)
//          DD DDNAME=SYSIN
//LKED.SYSIN DD *
  INCLUDE SYSLIB(TRAC,BLKDATA)
  ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO,SPACE=(TRK,(1,1)),DISP=(NEW,DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
//          DCB=(RECFM=FB,LRECL=80,BLKSIZE=80,SPACE=(80,(100,50)))
//GO.FT11F001 DD DSN='diode library',DISP=SHR
//GO.FT12F001 DD DSN='transistor library', DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN DD *
```

TRAC piece part data deck

/\*

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